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botany,' while this is said to be 'a second book.' The former ('Plant Relations') attempted to treat the subject from an ecological standpoint, and in our opinion the author failed to make it 'a first book'; in the present volume morphology is the dominant subject, and, as if in some doubt himself, the author says in the preface: "It may be, however, that many teachers will prefer to begin with the morphological standpoint as given in this book. Recognizing this fact 'Plant Structures' has been made an independent volume that may precede or follow the other, or may provide a brief course of botanical study in itself." This remarkably flexible purpose has been well carried out by the author. He has made an excellent *first* book of botany, in spite of its title.

The book follows the approved sequence from the simpler to the more complex plants, and the treatment is that which has been developed in the best botanical laboratories. The very helpful 'Suggestions to Teachers,' prepared by Dr. Caldwell to accompany the book, emphasize the practicability of the course here outlined. One feels as he runs over the pages that he is on ground which has been traversed again and again by teachers and pupils, and that all the work outlined *can* be done, because it *has been* done again and again.

We should like to take up the chapters in detail, but that cannot be done in a brief notice. We could ask here and there for a less confusing sequence (*e. g.*, where Slime Moulds and Bacteria are taken up after Toadstools and Puffballs, and Coleochaete in the midst of the Bryophytes), and far less of generalization before the pupil has some facts in hand (*e. g.*, in Chapter III., where the evolution of sex is discussed when he is as yet in total ignorance of the structural facts on which the theory is hung). On the other hand, the author's generalizations in the form of summaries from preceding groups (*e. g.*, Thallophytes, Bryophytes and Pteridophytes), are admirable.

The illustrations are good, and well chosen. Many have a delightful freshness, in sharp contrast to the well-worn cuts so long familiar in similar text-books.

CHARLES E. BESSEY.

THE UNIVERSITY OF NEBRASKA.

Observations made at the Blue Hill Meteorological Observatory, Massachusetts, U. S. A., in the Years 1897 and 1898. Under the direction of A. LAWRENCE ROTCH, A.M. With an Appendix containing the *International Cloud Measurements during 1896-97*. Annals of the Astronomical Observatory of Harvard College. Vol. XLII. Part II. 4to. Cambridge, 1900. Pp. 131-280.

The cloud work done at Blue Hill Observatory is known to meteorologists the world over, the publications on clouds already issued by this Observatory having been among the most important contributions to meteorology in recent years. This satisfactory result has been made possible through the liberality of Mr. A. Lawrence Rotch, the founder and director of the Observatory, and through the admirable work done at the Observatory by Mr. H. Helm Clayton and his associates, Messrs. S. P. Fergusson and A. E. Sweetland. Mr. Clayton's *Discussion of the Cloud Observations* made at Blue Hill (Annals Harv. Coll. Obs'y, Vol. XXX., Part IV.), is the most complete publication on clouds ever issued (see SCIENCE, N. S., Vol. V., 1897, pp. 468-469). When the 'International Cloud Year' was begun on May 1, 1896, in accordance with the recommendation of the International Meteorological Committee in 1894, the Blue Hill Observatory was one of the stations in the United States which co-operated in this special work, the other stations being those under the jurisdiction of the Weather Bureau. The present volume includes the usual meteorological observations made during 1897 and 1898, publication of which was delayed in order that an appendix containing a discussion, by Mr. H. H. Clayton, of the *Measurements of Cloud Heights, Velocities and Directions*, carried out during the 'Cloud Year,' might be included. In this Appendix are printed the tables containing details of all the cloud observations made throughout the 'Cloud Year,' together with tables showing the mean heights and mean velocities of the clouds at different hours and seasons; the number of clouds and measurements; the mean, maximum and minimum heights and velocities by months; the mean heights with different temperatures and pressures; the mean heights with different gradi-

ents; the mean heights of clouds from different directions; the mean velocities and frequencies of the clouds at different heights; the frequencies of the different currents at different heights, etc. The mere enumeration of the headings of these tables will suffice to show the thoroughness of the work discussed in this volume—a thoroughness which is characteristic of all of Mr. Clayton's cloud studies. The text accompanying the tables discusses the methods of measurement and of computation employed, and the meteorological results of the investigation. It is impossible to present any adequate summary of the important results reached by Mr. Clayton. Those who seek further information should turn to the volume itself, which is worthy of careful study. There is, however, one point which we would notice here. From a series of special measurements of cumulus and fracto-cumulus clouds, made with a view to determining the relation between the heights of these clouds as obtained by theodolites and from the dew-point, it appears that turreted cumulus clouds are most frequent at the coldest time of day, and not at the warmest, as is the case with ordinary cumulus. Thus, as Mr. Clayton points out, it seems that the diurnal period of the turreted cumulus is not determined by heating at the ground but by cooling at the surface of the cloud. The turreted cumulus probably forms only when the decrease of temperature from other causes approaches the adiabatic rate. It is thus an indication of thunderstorms, for a rapid vertical decrease of temperature in the upper air, when combined with a rapid decrease in the lower air caused by heating at the ground, favors the ascent of columns of air from the ground, to great heights and this is a condition favorable to thunderstorms.

The present volume is fully worthy to take its place in the line of Blue Hill Observatory publications as another important American contribution to meteorology.

R. DEC. WARD.

BOOKS RECEIVED.

Text-Book of Paleontology. KARL A. VON ZITTEL.
Translated and edited by CHARLES R. EASTMAN.
London and New York, The Macmillan Company,
1900. Pp. ix + 706.

Volumetric Analysis. JOHN B. COPPOCK. London, Whittaker & Co.; New York, The Macmillan Company. 1900. Pp. 92.

The Soul of Man. PAUL CARUS. Chicago, The Open Court Publishing Company. 1900. Pp. xviii + 482.

The Teaching of Elementary Mathematics. DAVID EUGENE SMITH. New York and London, The Macmillan Company. 1900. Pp. xv + 312.

The Criminal, his Personnel and Environment, a scientific study. AUGUST DRÄHMS, with an Introduction by CESARE LOMBROSO. New York and London, The Macmillan Company. 1900. Pp. xiv + 40.

SOCIETIES AND ACADEMIES.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

At the 514th meeting of the Society, held at the Cosmos Club on March 3d, Professor C. Abbe read an obituary notice of Professor H. A. Hazen. Dr. L. A. Bauer, then gave a detailed statement of the methods to be pursued in carrying out the magnetic survey of the United States by the Division of Terrestrial Magnetism of the U. S. Coast and Geodetic Survey.

As an indication of the scope and character of the data to be derived from the detailed magnetic survey of the United States, a brief statement was given regarding the results obtained from the detailed magnetic surveys of Maryland and of North Carolina. Furthermore there were exhibited various charts giving a graphical analysis of the earth's magnetic field for various portions of the United States.

With the aid of these charts, it was shown very clearly how inadequate it is for the formation of theories of the earth's magnetism to have simply declination data alone.

Following Dr. Bauer's paper, Dr. Alexander Macfarlane of Lehigh University, discussed the 'Square Root of minus one.' He reviewed the explanations published by Payfair, Buéc, Argand, Français, Gauss, Cauchy, Boole, Hamilton, Cayley and other mathematicians and concluded that $\sqrt{-1}$ does not indicate direction nor rotation of the quantity to which it is attached, nor a turning of the plane of representation, nor a special unit; that + and - are not signs of addition and subtraction but are signs of affection, and so is $\sqrt{-1}$. He gave analytical expressions for these signs, which